Mushroom News

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Vol. VII No. 5 JULY 1959

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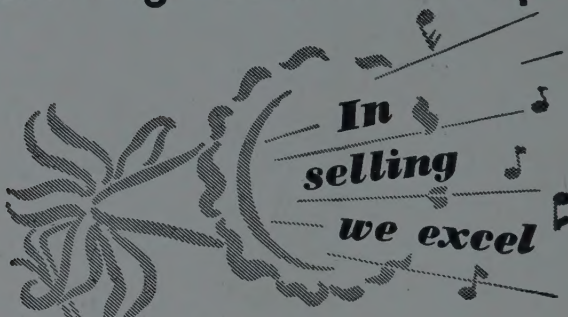

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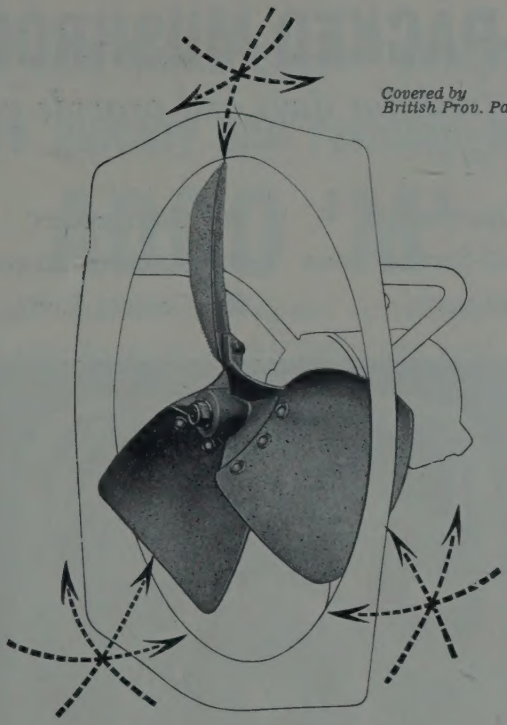

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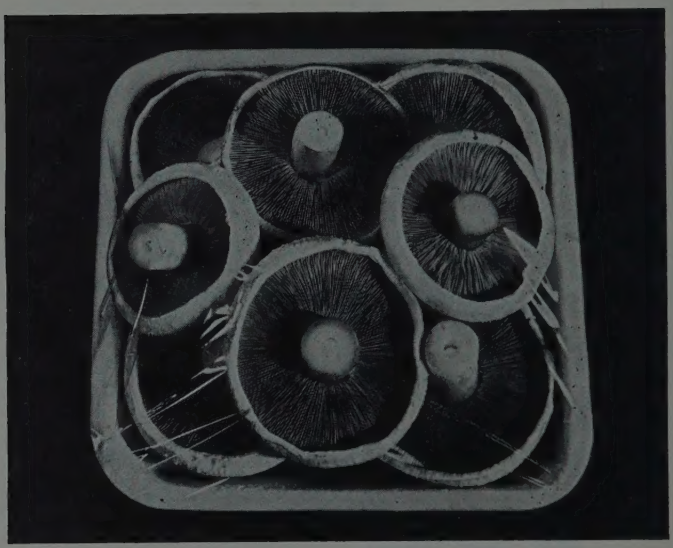

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Mushroom News

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OUR FRONT COVER

Pigs are in the picture! With the news of an impending invasion of Danish bacon into the home market comes an increased interest in pig manure as a basis for mushroom composts. H.G. Schaffer reports on the latest developments in composting pig manure in this issue of "Mushroom News."

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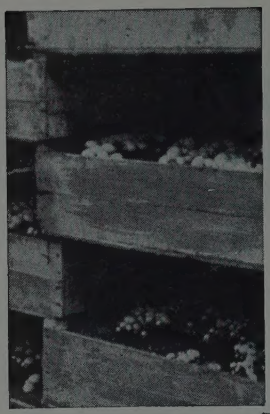

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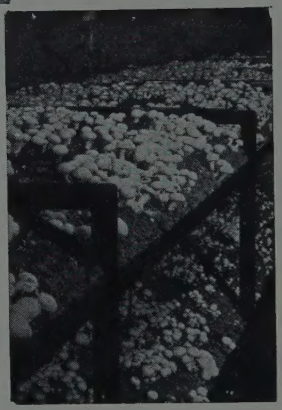

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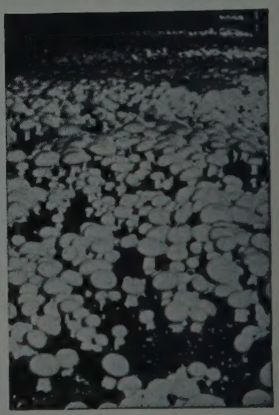

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Mushroom News

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WORTHING ENGLAND

Vol. VII No. 5 **JULY 1959**

Mushroom Washing

FROM the moment of picking the appearance of a mushroom begins to deteriorate, and the gradual browning of cap and stem, accelerated by bruising and high temperatures, reduces the mushroom to an unsightly — and unsaleable — condition in a relatively short space of time. Very few other horticultural products have such a limited life, and research work to slow down or halt the natural processes leading to unsightly discoloration is of vital importance to the mushroom industry.

The brown discoloration is the result of a strong oxidizing enzyme called polyphenol oxidase. The influence of this enzyme varies with the temperature and the concentration of the substrate or food material with which the enzyme reacts. If low temperatures can be maintained from the time of picking throughout the routine of marketing, then the enzyme activity is kept at a low level and browning is delayed. Bruising of the mushroom brings the enzyme, which may be in one part of a cell, into contact with the substrate, which may be in another part, and so accelerates the reaction.

Work on this problem is by no means new and mushroom growers will recollect that the question was discussed at the proceedings of the First International Conference on Scientific Aspects of Mushroom Growing in England in 1950 when a paper was read by M. Sarazin based on previous research work carried out by I. H. Voinovitch, J. Cheftel, J. Durocher and E. Kahane in 1949 and published in Comptes Rendus des Acadamie des Sciences, vol. 228, p. 1823.

The problem confronting research workers is that of finding a reducing agent that will effectively counter the oxidising action of polyphenol oxidase, and introducing it in such a way to the mushroom that it will do its work efficiently. Among reducing agents tried at Delaware University are sodium sulphite and bisulphite, ascorbic acid and compounds containing thiol. Of these, the latter are by far the most efficient, but pose many problems of toxicity.

A detergent wash containing the reducing agent is the most usual method of treating the mushroom. The detergent wash not only removes actual dirt from the mushroom but also reduces the surface tension so that more of the reducing agent is taken in. However, the amount of detergent must be finely gauged, for if the concentration is too high then too much surface tension is removed

and the cells collapse, ruining the mushroom.

A further complication that has been exposed by D. H. Hughes of the University of Delaware is that there is a difference between the mushrooms in the various flushes. First flush mushrooms deteriorate more rapidly than those produced later, and respond less well to chemical treatment, yet they represent from 25 to 50 per cent of the total crop. Chromatograms show that first flush mushrooms contain far more of an amino acid, tyrosine, than later mushrooms, and tyrosine is thought to be a substrate for the browning enzyme. As the concentration of tyrosine in mushrooms decreases with the age of the crop, so the keeping quality improves.

Practical washing systems incorporating detergents and reducing agents are now available to growers, and later in this journal we describe the Ronjonite System which is already in use in this country. It can be seen, however, that the problem of preserving the appearance of the mushroom for as long as possible is a complex business and will require a great deal more research before it is satisfactorily solved.

Notes and News

Minimum Price System.

The N.F.U. are planning to investigate the minimum price system in Belgium, Holland and West Germany, and its effect on the horticultural market in the U.K. The minimum price system is a method of import control that is not operated in this country, and has led on occasions to heavy importations of horticultural produce at a time of glut.

Supplies of Urea.

The opening of Shell Chemical Company's new fertiliser plant at Shellhaven, Essex, may lead to an easing of the supply of urea for agricultural purposes. The new plant is designed for the manufacture of ammonia, nitric acid and Nitra-Shell nitrogenous fertiliser. It would be possible to produce urea as a by-product.

We have carried stocks of agricultural grade urea for several years and many growers have tried it as a nitrogenous supplement for their manure. Supplies have never been assured, however, and the price has been high.

Versatile Grower.

Mr. Anthony Booth, the Jersey mushroom grower and playwright, appeared on B.B.C. Television recently in the "Top Town" programme. He gave three extremely amusing character studies.

Fairfield.

Mr. A. J. Bedding is the new director of Lancashire's Glasshouse Research Station at Fairfield. His appointment follows Mr. G. F. Sheard's move to the Glasshouse Crops Research Institute at Toddington.

Mr. Bedding was a N.A.A.S. advisory officer in Hertfordshire, working mainly in the Lea Valley, before becoming senior officer at Stockbridge Experimental Station. Both Fairfield and Stockbridge stations are active in practical mushroom work.

" Annual increase in production of 1,500,000 pounds of mushrooms "

HIGH YIELDING MUSHROOMS FROM IRRADIATED SPORES

by

Kenneth J. Cole, N.D.A., C.D.A.

SINCE commercial mushrooms are not a type of plant that produces seeds, a careful selection from naturally occuring or irradiated spores seems to offer the best opportunity to improve existing strains.

This premise proved true in the case of culture No. 286, isolated at the Pennsylvania Agriculture Experiment Station and introduced to growers in 1952.

This culture—states a recent communique by L. R. Kneebone, Associate Professor of Botany and Plant Pathology at the Pennsylvania Station—has resulted in an annual increase in production of 1,500,000 pounds of mushrooms valued at nearly 450,000 dollars, according to reliable estimates.

Irradiation which produced this valuable mutant spore was performed with ultra-violet light, but gamma and thermal neutron radiations are also being tried comments Dr. Kneebone. The new mushroom research centre, now completed at University Park, Pennsylvania, will greatly facilitate these research activities.

Special attention has been given to the selection of desirable strains from single colony isolates from both irradiated and non-irradiated spores. More than 1,000 single colony cultures from irradiated spores have been selected and screened by the university researchers. Three isolates, Nos. 286, 290 and 291, have exhibited superior vigour and yield, two other Nos., 288 and 289A are light-mutants from brown parents.

High Yield Cited

In two experimental crops, No. 286 produced yields twenty and thirty-one per cent better than check strains in commercial use. The faster growth of No. 286 permits earlier picking of each flush and a longer picking season since the number of nonproducing days is lessened. Spawnmakers have to maintain less inventory and orders are able to be filled on shorter notice.

This single colony selection was made from a pure suspension of spores in sterile distilled water which was pipetted on to hard-potato-dextrose-yeast agar plates. The plates were then irradiated for forty minutes at a distance of six inches under a "Uviaire" germicidal lamp. The selection was maintained on agar and on rye grain until its production characteristics were ascertained.

Growers who wish to try the strain referred to in this article, may obtain supplies as Grain Spawn from W. Darlington and Sons Ltd., Worthing, Sussex.

The Mushroom Section, Glasshouse Crops Research Institute.

GLASSHOUSE CROPS RESEARCH INSTITUTE

OPEN DAY

10th JUNE, 1959

The Glasshouse Crops Research Institute at Toddington, near Littlehampton, is now the centre of basic research for the mushroom industry. At the annual Open Day on the 10th June, growers learned of the latest developments in the mushroom field, and inspected the trials in progress in the new houses.

THIS year there was no special Open Day for "mushroom growers only" when the Glasshouse Crops Research Institute opened its gates to subscribers, and they had to take their place with the tomato, carnation and other growers on the 10th June, when Mr. F. W. Toovey, O.B.E., the Institute's Director, gave an outline of work in progress and new developments at Toddington.

On their way in they passed the half-completed administrative block, which will house among other things, the library, and will give more elbow room for the scientific staff in the laboratory block.

Introducing new members of the staff, Mr. Toovey mentioned Dr. L. Broadbent, lately of Rothamsted, who has been appointed Head of the Plant Pathology Division comprising the Departments of Entomology, Mycology and Virology. This appointment will be of especial interest to mushroom growers for most of the mushroom research work comes under these departments. Another appointment is that of Mr. M. Hollings to the Virology Department; Mr. Hollings comes from the Ministry of Agriculture Plant Pathology Laboratory at Harpenden, and is a leading worker in the field of virus diseases, especially of ornamental plants. Mr. G. F. Sheard from the Fairfield Station heads a new department of Horticultural Research, charged with undertaking research on horticultural problems which do not fall within the provinces of the research departments already established at the Institute. Finally, Mr. D. Cooke has been appointed as Statistician to increase the efficiency of experimentation by the investigation of problems in the design and analysis of experiments.

Lunch in a marquee was followed by a short speech by Mr. T. Ainslie Robertson, Chairman of the Governing Body, and Mr. Toovey's report of work in progress and planned for the future. Fundamental research

is always a slow business, and practical growers may at times wonder whether there is any point in it. Quoting growers who claimed that practice has outstripped research, Mr. Toovey said that often the fruit of one line of work may not be apparent for years, and that when a striking result is obtained, people tend to forget the long period of patient work that lies behind it.

After lunch growers split up to tour the Research Institute, and the mushroom growers, who included Mr. Raymond Thomson, Chairman of the M.G.A., and Mr. Frank Bleazard, headed for the mushroom section.

Mr. P. B. Flegg is continuing his studies into the function of the casing layer in relation to the production of fruiting bodies or "mushrooms". He has found a relationship between the level of moisture stress in the casing, and the production of mushrooms; a dry or saline layer can stop production altogether, while increased moisture (or low moisture stress) results in more and more mushrooms being formed. Fruiting does not occur on uncased compost as the moisture stress is too high due to the presence of large quantities of soluble salts. If this concentration can be reduced, by frequent watering, fruiting can be stimulated and small scale trials gave 1lb. mushrooms per square foot off uncased compost compared with 1.65lb. from compost cased with peat and chalk.

Mr. Flegg also showed his prototype chamber in which it will be possible to control the environmental conditions during the growth of the mushroom. Eight of these chambers, in which temperature, humidity and ventilation can be controlled, are now being constructed.

In the Entomological Department, Dr. N. W. Hussey continues his work on the life histories of various species of Cecid. The Cecid larvae, which presented such a problem to growers in 1957, can be controlled by the use of B.H.C. in the compost, and Dr. Hussey is working to establish the insecticidal concentrations than can be tolerated by the mycelium.

Miss D. G. Gandy is carrying on her researches into mushroom diseases in the Department of Mycology, and she had set up a most interesting exhibition to demonstrate some of the things she had discovered in the field of the complex of complaints variously named La France, Watery Stipe or just plain Brown Disease. She has made cultures from mycelium and sporophores from affected crops, and these show a lack of vigour not usually found in cultures made from healthy crops. Possible causes are the presence of an infective agent and a

Mr. F. W. Toovey, O.B.E., Director of the Glasshouse Crop Research Institute at Littlehampton

Mushroom growers listen while Mr. P. B. Flegg explains his prototype controlled environment chamber.

change in nutritional requirements. Experiments on the possible transmission of "Watery Stipe" disease by compost and casing material are in progress in one of the new mushroom cropping houses. Previous experiments have shown that when such material from affected crops is inoculated into test plots the spawn usually deteriorates rapidly although the symptoms of the 'Watery Stipe' disease are not produced with any severity.

Those growers who took advantage of the Open Day were impressed by the way the team at Toddington is tackling the basic research problems of the industry. Immediate results cannot be expected, but every day new knowledge is being gleaned that must in the future lead to practical improvements in cultivation and the control of pests and diseases.

THE FUTURE OF HORTICULTURE

In the House of Commons on the 1st May, Major H. Legge Bourke moved the following motion: "That this House, bearing in mind the expansion of European and North African horticultural production and the all-round increase in producers' costs, calls upon Her Majesty's Government to give urgent consideration to the problems of developing British Horticulture in the way required in the foreseeable future and the means whereby growers may fairly be enabled to play their full part in meeting the demands of the consumers".

In his speech, Major Legge Bourke emphasised repeatedly the great increase in imports of foreign horticultural produce into this country and said "This increase has been pumped into our market because all the other European markets where normally they would be going have operated far more drastic import controls than we do".

He called for an agonising reappraisal of general trade policy by the Government and the Conservative and Labour parties. Costs were going up, profits were going down. Growers wanted a reasonable return for what they grow, a return which is not converted into a loss as a result of unfair foreign competition.

"No amount of pumping in additional capital or of Liberalising, 'Runcimaning' or 'Swashing' or marketing improvements, will save British Growers".

" . . . . . The premium on washed mushrooms averages 6d. per pound . . . . . "

WASHING MUSHROOMS

Mr. Graham Griffiths

We are indebted to Mr. Graham Griffiths of Wrington Vale Nurseries, Congresbury, Somerset, for the information given in this article. He is responsible for introducing the Ronjonite System of washing mushrooms to this country, and is enthusiastic about the results.

Why wash mushrooms? The question is being asked by many growers since the Farm Walk at Wrington Vale Nurseries when the Ronjonite System was demonstrated. After all, it seems an unnecessary complication to add to the growers' many burdens especially at a cost of 2d. per pound when everyone is desperately seeking ways of reducing production costs.

Mushroom washing as part of the preparation of the crop for market has been developed in the U.S.A. and has three inter-connected purposes. Firstly, by increasing sales appeal it induces the public to buy. Secondly, it gives the grower a better price for his product and, thirdly, it gives a longer shelf life.

Taking these points in order, increased sales appeal must inevitably increase demand, for while it is possible for the eye to pass over a soiled chip of dirty and stained mushrooms, it is not so easy to resist the urge to buy neat buttons or cups, snow-white against the blue paper of a chip basket. Too many mushrooms today present an unappetising appearance when they are shown on the retailer's counter.

Secondly—and this must be the principal appeal to growers—washed mushrooms command a better price than unwashed mushrooms. Experience at Wrington Vale shows that the premium on washed mushrooms averages 6d. per pound and has been as high as 1/6d. and this is borne out by an inspection of salesmens' invoices. Since the washing process puts 2d. on the cost of production, the nett gain is unlikely to be less than 4d., and possibly more.

Thirdly, the question of shelf life is one of increasing importance now that mushrooms are becoming more popular over a wider circle of the buying public. The grower rarely gives much thought to what happens to his produce once he has seen it off at the station; if he were to see one of his chips on display in a shop two or three days later he would, no doubt, disclaim responsibility for their tattered appearance. Washed mushrooms keep their pristine appearance for at least twenty-four hours longer than unwashed mushrooms, and this quality is a con-

In this picture can be seen the two stainless steel tanks mounted in the angle-iron frame. A tray has just been removed from the 'A' Solution and is being allowed to drain before immersion in the 'B' Solution.

siderable inducement to the retailer to purchase the former when he can get them. In a test at Wrington Vale, washed mushrooms were kept in a refrigerator for eleven days alongside a sample of unwashed mushrooms. After this time the washed mushrooms presented the same appearance as unwashed mushrooms would after three days. There can be no doubt that retailers are going to look more and more for washed mushrooms, knowing that they will sell better on the second day of display.

So much for the considerations that must influence modern mushroom growers when they contemplate installing washing plant. What is the plant required, and how is the process done?

While there are other methods in use in America, the Ronjonite System is the one in use at Wrington Vale. As Wrington Vale Prepackings Ltd. hold the European agency for the system, it is the Ronjonite System which growers are most likely to come in contact with. It was devised and developed by Mr. R. J. Annaballi and Dr. M. J. Reider of Ron Jon Inc., Temple, Pennsylvania, and is widely used in the U.S.A., where it is estimated that over 50 per cent of mushrooms are washed before marketing. The system is broadly representative of all washing methods in operation today, although details of the equipment used and the means of drying vary.

In the Ronjonite System, two stainless steel tanks are used, mounted in a simple framework that carries them at a convenient operating height. Each tank holds a different solution, and a tray of mushrooms is first immersed in one tank, drained, and then immersed in the second tank. The mushrooms are then removed to the drying room.

The first tank contains Ronjonite "A" at 3 ounces to nine gallons of water, and the temperature of the solution should be 2 degrees F. above the temperature of the mushrooms. This slight temperature differential causes the cellular content of the mushroom to expand and so prevents free dirt in the solution being absorbed into the mushrooms. This first tank is a "pre-wash", the material conditioning the water so that the dirt is freed, and the heavier deposits of soil or peat, and insecticidal residues are removed.

The mushrooms to be washed are placed in an open-mesh sieve, the

metal of which has been coated with vinyl plastic. The sieve is dropped into the tank and rests on two ledges at the bottom, so that there is free space below for the debris of washing to settle. The mushrooms, being buoyant, "float" in the water and can be gently agitated with the hands in a rotary movement that dislodges the dirt and ensures that the solution comes into contact with all parts of the mushrooms. The tray remains in the solution for thirty seconds, and after thorough agitation, is lifted clear and the free solution is allowed to drain back into the tank. The sieve is then submerged in the second tank containing Ronjonite "B" at 6 ounces to 9 gallons of water.

This second solution must be kept at as near to 40 degrees F. as possible, and temperature adjustment is made by dropping in pieces of ice. Ronjonite "B" is the detergent wash, and thoroughly cleans the mushrooms of dirt, the mushrooms being agitated as before with a rotary motion for a minute and a half. By now the mushrooms should be quite clean, and the sieve is lifted clear and excess solution allowed to drain off.

The solutions in the two tanks can be used again for a second sieve, and so on until approximately 150 pounds of mushrooms have been washed for the expenditure of the 9 ounces of Ronjonite (*i.e.* 3 ounces of "A", 6 ounces of "B"). However, the material is so cheap that it is worth renewing the solutions at frequent intervals rather than to continue to use the same material when it is overloaded with dirt and other debris.

The Ronjonite System covers the actual washing of the mushrooms. The drying of the wet mushrooms is perhaps the most tricky part of the operation, and at Wrington Vale a special drying room has been constructed to complete the operation. It measures 17 feet by 12 feet, and is approximately 8 feet high. To provide the constant stream of hot air necessary, a 5 kilowatt unit heater with 4-bladed electric fan, giving 1400rpm is mounted at one end of the room. The mesh sieves of wet mushrooms are mounted on a two-tier rack of steel tubing, and the warmed air circulates freely between them. A thermostat controls the temperature at 74 degrees F., and a wet-and-dry bulb thermometer checks humidity.

The mushroom trays are moved along the rack from the end nearest

A corner of the drying room. The unit heater is out of sight on the left. As the mushrooms dry, they are moved towards the right, away from the source of heat.

the heater, at present by hand although it is planned to make this movement a mechanical one at an early date. Under normal conditions each sieve of mushrooms is dried within one hour, the rate of production depending on the number of sieves employed. The present installation at Wrington Vale has dried 1,300 pounds of mushrooms between 10 a.m. and 5 p.m.

Mr. W. A. Dawson, a Director of Wrington Vale Prepacking Ltd., states that the drying of the mushrooms presents the principal difficulty to the grower. It is, however, a problem that can be solved by the application of common sense and heating principles. The humidity of the drying room must be lowered as much as possible before the first trays are placed in the racks, and the wet-and-dry bulb thermometer must be watched carefully, especially when the weather is humid.

From this description it can be seen that washing mushrooms is not a complicated process, and it is well within the capabilities of the average mushroom grower. Nor is the initial capital expenditure excessive, for a small plant capable of washing around 800 pounds of mushrooms per day can be installed for less than £100. At a premium of 4d. per pound, it will not take long for the initial cost to be returned to the grower.

At Wrington Vale, the washing plant is used for buttons and cups, and there is no reason to bar mushrooms because the veil has broken, for the drying equipment effectively dries the gills when they are exposed. Opens and flats are sent to market in the usual way. A close watch has been kept on returns, and there is a growing demand for the washed mushrooms from salesmen throughout the country.

For those growers who have installed cold rooms for holding mushrooms during glut spells, the Ronjonite System will have an added attraction, for the keeping properties of the washed mushrooms are further enhanced by a short spell in the store. Obviously this will yield an additional bonus on the mushrooms at a time when prices will be low.

Washing mushrooms is certainly here to stay, and it can be seen that it is not beyond the resources of any grower to wash his produce and market it in the best condition. Washing cannot improve poor mushrooms, but it can make good mushrooms look even better, and provides a positive step towards increasing the price received for a relatively small additional cost.

Mushroom News

21 Years Ago

Most peats are acid and hence careful addition of lime is essential to counteract this as an acid soil will materially reduce the crops.

Careful attention must be given when watering the beds where peat is used. It is very easy to get the beds too wet if the high moisture-retaining properties of the peat are not carefully taken into consideration.

"*Mushroom News*," *June 1938*

COMPOSTING PIG MANURE

by

H. G. Schaffer

There is an increasing interest among growers in pig manure as the basis of a mushroom compost and in this article the well-known horticultural writer, Mr. H. G. Schaffer discusses the principles of composting using the by-product of the sties.

DELEGATES to the fourth International Mushroom Congress at Copenhagen in July will be able to see the results of more than five years' research on the use of pig manure for compost carried ou at the Mushroom Research Station attached to the Royal Veterinary and Agricultural University, Copenhagen. The Director, Mr. C. Riber Rasmussen, has been in personal charge of the work and has now reached the point where he can say with confidence that pig manure compost will produce better results than synthetic composts and, in some circumstances, can equal and even surpass horse manure.

For Denmark, with a vast pig population and a steady decline in horses, his discoveries are of special value, but they also have importance for British growers who have difficulty in obtaining adequate supplies of horse manure.

Mr. Rasmussen gave the first indication that he was beginning to solve the specific problems of pig manure composting at the International Mushroom Congress in Paris in 1956. He explained that his first series of experiments were a complete failure, because of inexperience in selecting the manure and lack of knowledge of how to compost it. He had, in fact, the same bitter experiences as many growers who have tried pig manure and abandoned it as unsatisfactory. But his paper at the Paris Congress went on to describe further work which led him to believe that with more experience "Pig manure may provide a good substitute for horse

A self-propelled manure turner at work in the yard of Mr. A. B. Stridberg of Lockarp in Sweden, turning pig manure.

manure and possibly a better one than the synthetic composts known today".

Subsequently, I visited Mr. Rasmussen at his experimental house at Copenhagen. I also discussed with him the latest results of his work, during the International Horticultural Congress at Nice last year. He told me that the secret of successful pig manure composting was to use far less water than with horse manure.

"When I started this work" he said, "I got less than one-sixth of the yield compared with horse manure compost. I had been applying the same methods to the two manures. As I carried out more experiments, I realised that the fermentation process for the two manures is quite different".

Pig manure heats more easily and can easily become a solid mass with anaerobic fermentation (bacterial action without oxygen) operating right through the heap. This in turn leads to a sharp fall in temperature and a slowing down of the whole process. To guard against this development, Mr. Rasmussen stacked the piles about four and a half feet wide and about four feet high, pressing the sides lightly with the back of the manure fork and keeping the centre as loose as possible.

In this way, air is kept moving through the heap during the whole period of composting. The next problem arose when it was found that if too much water is added the heap becomes a solid mass despite all precautions and produces a greasy compost unsuitable for mycelium growth.

This led to the big discovery. The pig manure compost needs only about one-fifteenth of the water applied in the normal course of horse manure composting.

In his most successful experiments, he added 14 litres of water per ton of manure as against 585 litres for horse manure and 42 litres against 617. When the manure was turned for the first time—stacked as already described to ensure maximum passage of air—it had already turned dark brown, much darker than horse manure at the same stage. There was a very narrow fire fang area and in the lower middle zone an occasional yellowsh layer due to anaerobic action. The top five inches of the heap was slimy and this was forked off and gradually mixed into the pile.

At this stage the pH was 8.2 to 8.5 and a good deal of ammonia was released. Again very little water was

added—25 litres against 100 for horse manure and 47 against 94.

By the second turn, there was very little fire fang, no sign of anaerobic compost and the unpleasant smell noticeable at the first turn had disappeared. At this stage, neither compost needed much water and the two were almost alike.

C. Riber Rasmussen

A ton of composted pig manure covers only between 60 to 65 per cent of the area covered by a ton of horse manure compost and it must not be packed too lightly in the trays or beds.

Mr. Rasmussen found peak heating even more necessary with pig manure. In some experiments, the peak heated trays gave twice the yield of those that had not been peak heated. He advises 15 to 20 hours to bring the temperature to 137 to 140 degrees F. and peak heating from 55 to 70 hours. In all his experiments, Mr. Rasmussen turned both horse and pig manure on the sixth, tenth, thirteenth and sixteenth days, filling immediately after the last turn.

This is by no means the end of the story. Work has still to be done on the effects of chemical supplements, ammonium sulphate, calcium carbonate, superphosphate and gypsum. More important still, there is need, in Mr. Rasmussen's view, for scientific study of the microbiological and chemical variations in the two forms of composting. By the end of the process the moisture content is about the same. Perhaps in this field of research will be found the key to greater knowledge of the composting and of how to obtain greater output from a given quantity.

Yields of the two composts were roughly comparable; in one experiment the pig manure gave a better result. In comparing yield figures with British production, it must be remembered that in Scandinavia, the mushrooms are pulled and sold with the root attached. It is claimed that packed in this condition, they remain fresh two or three days longer. But it also means that there is often an apparently higher yield. With this proviso in mind, Mr. Rasmussen's results were about equal to those of a good commercial nursery here.

Controlled watering is best carried out by using a method such as the Cameron System.

Recently, I was talking to Mr. Eric White, manager of the J.B. and F.W. Young mushroom farm at Coleraine, Northern Ireland, who three years ago began experimenting with compost made up of equal parts of pig and horse manure. He told me that as a result of experience with this mixture and of other experiments, he had reached the same conclusion as Mr. Rasmussen, that the secret of successful pig manure composting is to reduce the amount of water.

One of the problems facing a mushroom farmer wishing to use pig manure is not so much to secure a source of supply, but to ensure the good strawy manure needed. Mr. White got over this difficulty by arranging with a local farmer to bed his pigs down with plenty of oat straw supplied by the nursery and to deliver the manure when required.

A grower wishing to experiment with pig manure should first organise his supply, for it must contain plenty of straw and it must be fresh.

MUSHROOM GROWING IN HUNGARY

The cultivation of mushrooms in Eastern Europe, although lagging well behind developments in the West, is expanding rapidly. We have recently supplied pure culture mushroom spawn to the State Agricultural Research station in Moscow and in this article by a keen Hungarian grower, readers will learn of progress in Hungary.

by

F. X. Veszelszky

After the First World War, the scarcity of meat and the rationing of other foodstuffs; further the poor and uncertain supplying of agricultural products had forced the population to seek some means how to eliminate the shortage of food.

For centuries the many species of wild mushrooms have been collected and sold in the markets in Hungary. There is nct the fear of wild mushrooms that exists in England. It was natural therefore that people should begin to think about the growing of mushrooms as a way to provide food.

Central Europe has long been a source of wild edible fungi, but since the war the cultivation of mushrooms has made tremendous strides forward.

At the beginning a few empty cellars were used in the vicinity of Budapest merely to try how to grow mushrooms. Widespread interest was manifested by numerous inquiries, received by the Ministry of Agriculture; partly emanating from persons eager to provide themselves with self-raised supply, partly from persons whose interest had been

The entrance to one of the large underground caverns near Budapest in which mushrooms are cultivated by a state-owned company.

aroused by news from other countries telling stories about financial successes obtained from growing them for profit.

Gradually the interest was spread over other larger cities all over the country.

Growing mushrooms at that time was very uncertain and a hard task.

In spite of the fact that Hungary was known as an agricultural country —people did not know very much about how to grow mushrooms.

Naturally, under such conditions, failures have far outnumbered successes. But need is a great teacher. Until 1926 crops were poor and uncertain, but experiments went on. In this year of 1926, Hungary succeeded in bringing from Bordeaux, France, some pure culture spawn, and thus stopped the continuity of failures.

This type of spawn brought new life for the industry. Growing Companies were organised. Laboratories set up. The distribution of "pure culture spawn" had a good start—which is still used today by nearly all commercial growers. It is prepared under absolute aseptic conditions of tissue and spores from selected mushrooms—in laboratories owned by the State and by chemical engineers as experts—since 1930.

A large Company growing mushrooms has in different parts around Budapest, large cellars and particularly for this purpose erected buildings.

This well organised State-owned Company showed the way for others interested in growing.

Soon an association for growers was formed with nearly 200 members; working on their own, but selling their products collectively.

Step by step, as the supply of suitable and dependable spawn was secured, many farms and others followed the way of growing. The industry has grown fast. Today the population of Budapest uses approximately 3,000 kg. (1 kg. = 2.20lbs.) mushrooms daily.

There is a good demand not only for households, large kitchens, etc., also for exports and for the canning industry. Hungary takes the sixth place among the mushroom-growing countries in the world: after the U.S.A., Great Britain, France, Belgium, Denmark.

Successful experiments are also made in powderizing second grade dried mushrooms. Already considerable quantities of wild mushrooms are collected in Central European countries for drying, and export to Western Europe, and with the rapid increase in the demand for canned soups this business may be expected to grow.

BOOK REVIEW

"Mushrooms" by Albert Pilat, with 120 coloured plates in the text by Otto Usak. *Revised edition*, 340 *pp.*, 11½" x 8½". *Spring Books, London*, 1958. 50/-.

This book by Dr. Pilat, the eminent Prague mycologist. was first published in 1954 in Holland, though as is the present edition, produced in Czechoslovakia, which doubtless explains its cheapness.

Printing, paper, and general get up are of high quality and the lithographic plates are excellent; large enough to allow different stages of development to be shown natural size. All were painted from living material, a task taking six years. Occasionally there are more than one species on a plate: all the 140 fungi figured occur in this country, though some not in the abundance for which Bohemia has long been famous.

The title, "Mushrooms", is misleading for larger fungi in general, both edible and poisonous, are included. There are six plates of *Agaricus* (*Psalliota*); *P. hortensis*, with the common name Garden Mushroom.

The descriptions of the different species are on the page opposite the plate figuring them which has the same numbering, convenient for reference but confusing for pagination. They are written in a clear, simple style, and though including much scientific detail they are easy to follow. Great stress is laid on the edible or other qualities—this is even summarised on the plates. Ways of cooking are given for some species and the author leaves no doubt about his preferences—but, as he says, De gustibus non est disputandum.

There is an introduction of 88 pages, the first half being an elementary treatise on mycology containing the sort of information only a specialist can present. The rest deals with edibility, poisoning, nutritive value and so on.

When discussing mushroom growing with Pilát two or three years ago he told me that there was no need for it in his country as "collecting fungi is a natural sport". This explains the inclusion of what many will find of particular interest: the Czechoslovakian Food Codex (Codex alimentarius) of 1937 listing 58 species that could be marketed; the regulation of 1942 which arranged these in four price groups: and the Regulations of the Ministry of Health, 1950 (No. 586) which deals with every aspect of preparation and sale—preserved, dried, frozen, pickled, fermented—with a supplement of 64 species and nine varieties of fungi. The English of the book is remarkably good. It does not read like a translation although there is also a Czech edition.

J.R.

INTERNATIONAL CONFERENCE

At the time of going to press, growers are gathering in Copenhagen for the Fourth International Conference on Mushroom Science. In our next issue we will summarize as much as possible of the practical information contained in the many papers to be read at the conference by internationally famous experts, together with comments by our representatives on their visits to Danish mushroom farms and research projects.

Growers Beware!

by

J. Wakelyn-King

Entrance to Mushroom cavern, Teheran.

In Palestine in '44 with Arabs knocking
on the Jewish door
With raids and curfews as the aftermath
of war
I met a man upon a mission bent
And, looking also for the ultimate
escape,
My ear I lent.

It seemed that mushroom growing was
the trend
For people who were slightly round the
bend
That compost heaps and mushroom
spawn were not
Beyond the reasoning of the average clot.

Upon this chance advice for good or ill
I set myself to work with all my will
And giving up the soldiers food and bed
Applied myself to compost heaps
instead.

From England with a civvy suit at last
I took a one-way ticket to the past
And headed out upon an East-bound
'plane
With nothing much to lose and all to
gain.

And wrapped within my only change of
socks
I carried a most unpretentious box
Of mushroom spawn . . . however did
you guess?
Without it I was bankrupt more or less

Arriving in Marseilles, Beirut, Baghdad
I dined and wined and things were not
too bad
But finally I reached the reckoning day
And landed in Teheran, Iran to stay

The customs viewed my spawn with
much suspicion
But finally they granted their
permission.
Apparently Agricus Campestris
Was something they had never really
messed with.

So passing me as genuine but odd
They raised their hands to Allah or to
God
And hoped that I would not contaminate
The Shah of Persia or his modern state;
(The fungus eaten at the royal sprees
Are horrid yellow monsters grown on
trees)

At last within the fruitfulness of time
My mushrooms grew and issued forth
sublime
And Anglo-Oil requested "If you can
A ton a month to fly to Abadan".

For twelve short months I practised in
the art
Of mushrooming from people far apart
No radio or news that I could mention
And so I missed one solid year of tension.

All Communist and Democratic fears
And propaganda never reached my ears
And her I married, nicely settled down
Some sixty minutes' donkey-ride from
town.

So with the progress of the National trend
The Anglo-Persian Oil began to bend
Deciphering the writing on the wall
We saw the time had come to end it all.

Australia beckoned as the future land
For people who would lend the weight of hand
To such a challenge we could only try
To make some effort, so we cast the die.

And finally despite the cost and care
We got our passage and forgot the fare
Appreciating prior to the wreck
Pyjama games with Mr. Moussadeq.

And so across the desert waste and sea
To "Aussie" where we juggled merrily
And battling with the elements anew
The mushroom seemed to understand and grew.

Thus growing we eventually found
We travelled over what was virgin ground
Developing with growing hand in hand
Were catering and general demand.

Then canners came and said "We'll take the lot"
And poultry growers said "What have THEY got?"
So mushrooms grew where hens were once at roost
And railway tunnels added to the boost

Straw supplies—and camel—Teheran

Subterranean source of water for the mushroom beds, Teheran.

(A wicked blow which wasn't very nice)
Succeeding in this dreadful strategy
They cut the price again the other day.
So economics entered in the field
And mushroom growers worried over yield

And mushrooms worried too, for they respond
To growers who are genuinely fond
Of growing them without regard to price
And just because they think them rather nice.

And now to make you fully realize
Inherent dangers in this enterprise
Regard with horror my eventual fate
In trying to escape ; Alas ! too late !

Proceeding on an overdue vacation
We called in Persia visiting relations
When was it ? Sixteen turns ago ;
Four composts ; and three heavy falls of snow.

One thousand kilos picked and packed anon ;
Two tunnels cropping and another gone :
While on the compost slab the heap is new:
How long ago was what ! I'm asking you ?

Now finally. . . Dilemma in UK
(provided we continue on the way)
Can mushroom growers counteract defeat
By regarding them as something nice to eat ?

TRUFFLE

by

John Ramsbottom

During hot weather the mushroom grower has to reckon with the possibility of Truffle infection. This "weed" fungus is encouraged by abnormally high temperatures in the compost and most growers have met with it at some time or other. Dr. J. Ramsbottom discusses the recent change in nomenclature of this fungus.

In 1930 W. W. Diehl and E. B. Lambert described a new truffle in beds of cultivated mushrooms. The fungus had first been noted by a commercial grower in Ohio, in May of the previous year, but within a month or two was also found in Minneapolis, New York and Pennsylvania. The authors had difficulty in deciding upon the systematic position of the fungus but it seemed expedient to them to place it among the Tuberales (truffles) "until more conclusive evidence of other relationship is established". They described it as a new species of *Pseudobalsamia*, *P. microspora*. Under this name it was first recorded for this country in 1936 by P. H. Williams from Cheshunt, and has since become widespread.

Helen M. Gilkey, an authority on American Tuberales, had been consulted about the taxonomic position of the fungus and had questioned the decision of the authors. In 1954, at the request of Dr. Diehl she went thoroughly into the problem and as a result made "a long overdue transfer of the fungus" from the Tuberales to the Eurotiales. Here is not the place to discuss in detail the points which decided her. The fungus certainly bears considerable external resemblance to certain truffles but in fungi, as in many other natural (and artificial) structures, appearance may be deceptive. Gilkey pointed out that the irregularities of the surface, and the wide range in size are not the consequence of a predetermined pattern of development but are the response of the fungus to conditions of growth: moreover the wall of the fruit-body consists wholly of interwoven hyphae. The decisive point, however, is the manner in which the asci are formed. Truffles have an intricate arrangement of asci, depending on the situation of the veins which range in complexity reaching their most intricate in the genus *Tuber*, *the* truffle. *Pseudobalsamia* has definite veins and the asci are arranged irregularly between them, whereas in the mushroom bed "truffle" there are no veins and the asci are formed as it were at random in the fruit-body and not in any kind of hymenial layer. This is characteristic of Eurotiales, a typical example being the small, yellow spherical fruit-bodies of the

common green mould *Eurotium herbariorum*.

As there was no genus described into which the fungus will fit, a new one, *Diehliomyces* was erected for its reception. So we have the name *Diehliomyces microsporus* (Diehl and Lambert) Gilkey. There is no necessity to change the common name of the truffle-like weed of the mushroom bed.

Gilkey's views have been confirmed recently by Lilian Hawker, who has added further details with photographs and figures.

The general opinion is that "truffle" is introduced to mushroom beds in casing soil—a sufficient explanation for the mushroom grower except that he would like to know what sort of soil is naturally infected. About this we know nothing: the fruit-bodies apparently have never been found apart from mushroom beds. It may be assumed that the fungus was not overlooked in America until 1929, for the fruit-bodies may reach more than an inch across, and often occur in large numbers. There is no reason to suppose that it was introduced in some way from there to this country, but that there was practically a simultaneous appearance on both sides of the Atlantic. Such a phenomenon is not unique in biology, though we have no satisfactory explanation—"changing conditions", "sudden change in the organism" and such like merely beg the question. It is perhaps worth stressing that mushroom beds are not the natural habitat of the fungus.

Strange as it may seem, *Diehliomyces* is not the only fungus affecting mushroom beds which has been mistaken for a truffle. Mr. F. C. Wood recently handed to me some compost covered with roundish, whitish bodies which had been sent to him as insects' eggs. When they matured they contained asci and were evidently allied to *Eurotium*, and proved to be *E. insigne*. This fungus has been baptised so often that the uninitiated might imagine that there had been a superfluity of naughtiness on the part of systematists. It was described as a truffle by the famous French mycologists Boudier and Patouillard and named *Lilliputia Gaillardi*; like *Diehliomyces* it belongs to the Eurotiales. The most recent name for the fungus is *Lilliputia rufula*, but whether that is its final resting place remains to be seen.

Lilliputia is not a serious weed. It has been recorded on a mushroom bed, Rathmines, Co. Dublin (1935), and on mushroom compost, Uxbridge (1938). It is known from dung of animals, damp paper, rotten grass clippings, decaying sea-weeds and such like, and is doubtless common on composting material.

References:

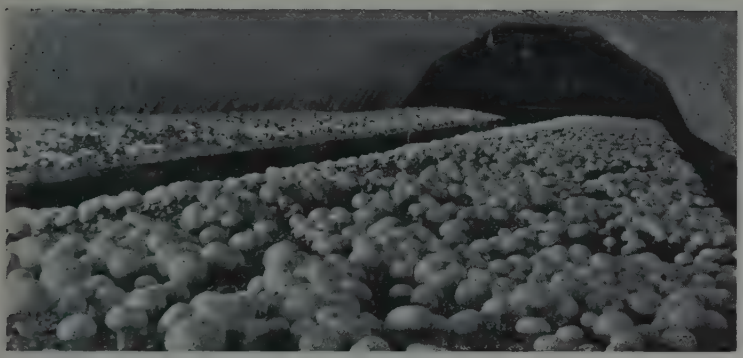
DIEHL, W. W., and LAMBERT, E. B. A new truffle in beds of cultivated mushrooms. *Mycologia*, **22**, 223 (1930).

GILKEY, H. M. Taxonomic notes on Tuberales. *Mycologia*, **46**, 783 (1954).

HAWKER, L. E. The development of the fruit-body of *Diehliomyces microsporus* (Diehl and Lambert) Gilkey. *Trans. Bot. Soc. Edinburgh* **38**, 70 (1959).

HUGHES, S. J. Studies on Microfungi, VIII *Orbicula* and *Lilliputia*. *Mycological Papers*, No. 42. *Commonwealth Mycological Institute* (1951).

WILLIAMS, P. H. A disease of mushrooms new to Great Britain. *Gard. Chron.* c. 2591, 147 (1936).



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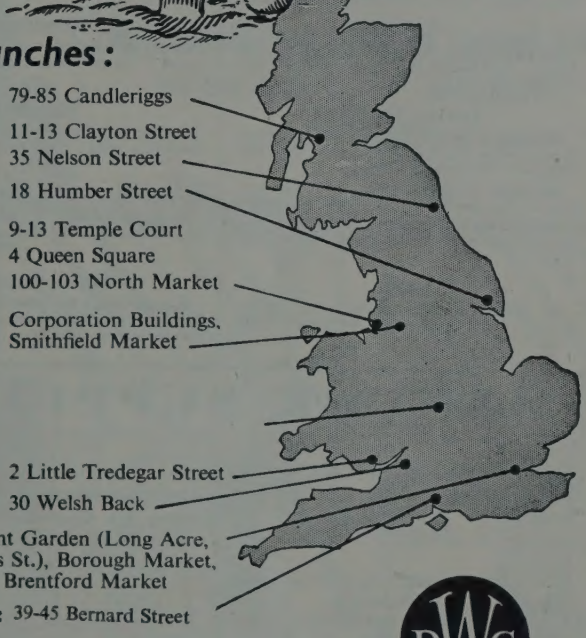

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